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KEY TO SUBFAMILIES OF ROBBER FLIES BASED ON PUPAL CASES, WITH A DESCRIPTION OF THE PUPAL CASE OF *DORYCLUS DISTENDENS* (ASILIDAE: MEGAPODINAE)

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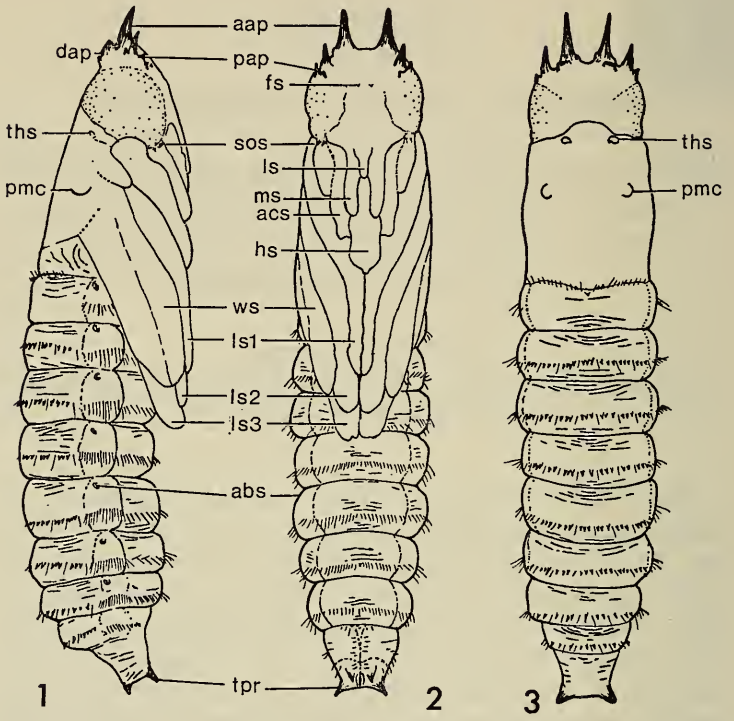
The immature stages of Asilidae are poorly known, as are those of most other families of Diptera. In my review (Knutson, 1972), I noted that only about 2% of the approximately 5,000 world species of Asilidae are known in any immature stage. Only four of the five generally recognized subfamilies are included in this number. Most of the relatively few genera and species for which descriptions of immature stages are available are members of the three largest subfamilies (Asilinae, Dasypogoninae, and Laphriinae). Limited data are available for the Leptogastrinae. Until now, nothing has been published on the immature stages of the remaining subfamily, the Megapodinae.

Doryclus distendens (Wiedemann)
Megapodinae
Pupal case (Figures 1–3)

Length (including anterior antennal processes), 10.8–12.8 mm; greatest width of thorax, 2.3–3.0 mm; greatest width of abdomen, 2.4–3.2 mm, tapering to 1.5–2.0 mm at greatest width of last abdominal segment. Subshining straw yellow, integumentary processes glistening reddish brown. Head with a pair of large, acuminate, straight anterior antennal processes (aap) not joined at base, a group of 3–4 basally confluent posterior antennal processes (pap), and one truncate dorsal antennal process (dap) at base of each anterior antennal process. Facial area with a pair of small medial spines (fs). Labral sheath (ls) and hypopharyngeal sheath (hs) elongate and smooth. Maxillary sheath



Figs. 1–3. *Doryclus distendens* (Wiedemann), pupal case. 1, lateral view; 2, ventral view; 3, dorsal view. aap, anterior antennal process; abs, abdominal spiracle; acs, anterior coxal sheath; dap, dorsal antennal process; fs, facial spines; hs, hypopharyngeal sheath; ls 1, 2, 3, leg sheaths; ls, labral sheath; ms, maxillary sheath; pap, posterior antennal process; pmc, posterior mesothoracic callosity; sos, suborbital spine; ths, thoracic spiracle; tpr, terminal process; ws, wing sheath.

(ms) with pair of elongate areas extending below labral sheath, almost to apex of anterior coxal sheath (acs). Two or three suborbital spines (sos) on either side of head ventrolaterally above base of anterior coxal sheath. Paired thoracic spiracles (ths) elongate oval, surrounded by a C-shaped ring of thickened cuticle, situated dorsally at anterior margin of thorax on rugulose area. Without anterior or posterior mesothoracic spines, but with a well developed posterior mesothoracic callosity (pmc) at base of wing. Sheaths of third pair of legs reaching anterior margin of abdominal segment 4. First abdominal segment with dorsal transverse row of about 30 erect, subequal, more or less uniformly shaped, straight, spinelike, yellowish processes; about 8 similar processes in

transverse row behind abdominal spiracle (abs); venter obscured. Second segment with median transverse row of about 20 short, stout, dull, dark, posteriorly directed processes, and with elongate, straight, yellowish spinelike processes interspersed between every 3rd stout process dorsally; about 11 such spinelike processes laterally on each side behind spiracle, and a mesally interrupted row of such spines ventrally. Third through seventh abdominal segments similar to each other, each with stout processes and spinelike processes dorsally as on second segment, with stout processes becoming recurved to erect, and sharper on posterior segment; 10–16 spinelike processes laterally behind each abdominal spiracle, and complete transverse row of spinelike processes ventrally. Abdominal segment 8 (terminal segment) composed of a ringlike anterior portion with a transverse circlet of processes, interrupted midventrally or absent ventrally, and a tapered posterior portion with a pair of strong, dark, dorsolateral terminal processes and a silghtly smaller pair of ventral terminal processes (tpr).

Martin and Papavero (1970) gave the distribution of *D. distendens* as, "Brasil: Santa Catarina. Para, Santarem." Six pupal cases of *D. distendens* are in the collection of the U.S. National Museum, Washington. Three specimens are labeled only, "Z-3224", "A. E. Pritchard Collection, 1962." Three other specimens are labeled, "Parita, Panama, Zetek #1689;" one of the latter pupal cases contains a well-formed, partially emerged adult. Bromley (1951) was apparently referring to these six specimens when he noted "The Megapodinae are wasp-like in appearance and are undoubtedly mimetic of certain aculeate Hymenoptera with which they are associated in a Mullerian association. Their affinities with the other Laphriinae are indicated by the fact that their larval and pupal stages take place in decaying wood. Dr. Zetek has reared certain species of this group from hollow citrus trees in Panama."

The Subfamily Classification of Asilidae

Various authors have used two, three, four, five, or eight subfamilies for the classification of the approximately 400 world genera of Asilidae. Bromley (1946) recognized four subfamilies: Asilinae, Dasypogoninae, Laphriinae, and Leptogastrinae. Hull (1962) recognized five subfamilies: Asilinae, Dasypogoninae, Laphriinae, Leptogastrinae, and Megapodinae. Martin (1968) raised the Leptogastrinae to family status. Martin and Papavero (1970) recognized only three subfamilies, considering the Laphriinae to represent tribes in the Dasypogoninae, and the Leptogastrinae as a separate family. Papavero (1973a) recognized eight subfamilies of Asilidae (Apocleinae, Asilinae, Dasypogoninae, Laphriinae, Laphystiinae, Ommatiinae, Stenopogoninae, and Trigonomiminae).

Carrera (1949) proposed the tribe Megapodini for five Neotropical genera (*Doryclus* Jaennicke, *Megapoda* Macquart, *Pronomopsis* Hermann, *Pseudorus* Walker, and *Senobasis* Macquart). The Megapodini were raised to subfamily rank by Hull (1962). Forty-three species of Mega-

podinae in six Neotropical genera (the above five genera plus *Pseudoryclus* Carrera) were recognized by Martin and Papavero (1970). Oldroyd (1974) p. 17, commented, "Hull is, therefore, justified in retaining this tribe [Megapodini], though perhaps not in raising it to the status of a subfamily." Papavero (1973b) included *Lagodias* Loew (Ethiopian, Palearctic, and Oriental Regions) and *Pegasimallus* Loew (Ethiopian Region) with the six Neotropical genera mentioned above in the tribe Megapodini, subfamily Dasypogoninae.

Papavero's tentative classification of the subfamilies is based on phylogenetic considerations, is worldwide in scope, and is probably a better arrangement than the classifications of previous authors. However, to facilitate identification of asilid pupae and pupal skins and for the purposes of the key presented below, I am recognizing the five groups accorded subfamily status by Hull (1962).

Key to Subfamilies of Asilidae Based on Pupal Cases

1. Anterior antennal processes small, truncate; posterior antennal processes absent; last abdominal segment with only 1 pair of terminal processes; abdomen laterally with elongate (longer than length of segment), hairlike processes ..... Leptogastrinae
   Anterior antennal processes large, acuminate; posterior antennal processes present; last abdominal segment with 2–6 pairs of terminal processes; abdomen laterally with short (shorter than length of segment), spinelike processes 2
2. Dorsal antennal processes present; anterior antennal processes almost straight; without anterior or posterior mesothoracic spines, but with posterior mesothoracic callosity; with suborbital spines and medial facial spines ..... Megapodinae
   Dorsal antennal processes absent; anterior antennal processes somewhat curved ventrad; with anterior and/or posterior mesothoracic spines, without suborbital spines; with or without medial or lateral facial spines 3
3. Lower face with small medial or lateral spines; posterior antennal processes usually with 4–5 confluent hooks each ..... Laphriinae
   Lower face without medial or lateral spines; posterior antennal processes usually with 3 confluent hooks each 4
4. Abdomen laterally behind spiracles usually with only 3 spinelike processes on each side; last abdominal segment with 2 or more pairs of terminal processes ..... Dasypogoninae
   Abdomen laterally behind spiracles usually with more than 5 spinelike processes on each side; last abdominal segment with 4 pairs of terminal processes ..... Asilinae

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